

MICHIGAN ENVIRONMENTAL SCIENCE BOARD
FIRE FIGHTER AND CANCER INVESTIGATION PANEL
MEETING SUMMARY
MONDAY, OCTOBER 26, 1998
RAMADA INN EXECUTIVE MEETING ROOM
125 HOLIDAY LANE
HOWELL, MICHIGAN

PANEL MEMBERS PRESENT

Dr. Lawrence J. Fischer, Chair
Dr. Raymond Y. Demers
Dr. G. Marie Swanson
Dr. Ralph H. Kummeler
Mr. Keith G. Harrison, Executive Director

DEQ/OSEP SUPPORT STAFF PRESENT

Mr. Jesse Harrold, Environmental Officer
Ms. Patricia Hiner, Executive Secretary

I. CALL TO ORDER

Dr. Lawrence J. Fischer, Chair, called the meeting of the Michigan Environmental Science Board (MESB) Fire Fighter and Cancer Investigation Panel (Panel) to order at 9:00 am.

II. EXECUTIVE DIRECTOR'S UPDATE

Mr. Keith Harrison, Executive Director, read the charge that had been received from the Governor on August 5, 1998.

Fire fighters involved in modern building fires may be exposed to a variety of toxic and cancer-causing substances that are produced when modern chemical components are incinerated. Because of this potential for exposure, it has been suggested that in the absence of confounding factors such as cigarette smoking, sufficient data exist to presume that there exists a causal relationship between respiratory tract, bladder, skin, brain, kidney, blood and lymphatic cancers and the fire fighting occupation. There is a need to research this cancer presumption as it relates to fire fighters.

Given the above, I am requesting that the Michigan Environmental Science Board (Board):

- 1. Evaluate the available cancer and occupational health scientific evidence regarding the level of risk posed to fire fighters from occupational exposure to toxic and cancer-causing substances, and*
- 2. Provide a determination of the level of cancer risk that can be expected in*

this occupational group, taking into account confounding factors such as smoking, frequency and duration of exposure to hazardous substances, and use and non-use of hazardous material personal protection equipment.

In the charge, the Governor also directed the Departments of Community Health and Consumer and Industry Services to cooperate with the MESB. He also encouraged looking for assistance from other sources. Mr. Harrison stated that the advice to seek outside assistance was one reason that Dr. Marie Swanson had been asked to serve on the Panel as a guest scientist. Also, Dr. Shelia Zahm from the National Cancer Institute, a recognized expert in the field, would be giving a presentation.

Mr. Harrison indicated that the charge was related to a bill that the Governor vetoed. According to Mr. Harrison, the Governor was concerned with the scientific validity of the cancer presumption put forth by the bill and wanted an outside evaluation.

III. PRESENTATION

Dr. Shelia Zahm (National Cancer Institute) presented a review of the epidemiologic literature. She began with information on exposures. Fire fighters are exposed to complex mixtures depending on what is burning, and whether it is a residential or a commercial setting. For example, at a hardware store there could be paints, pesticides, glues, or dry cleaning materials. In an industrial fire there could be solvents, PCB's and more exotic chemicals, and in a marine fire there would be fuels involved. There are also hazardous material incidents in which fire fighters are involved. One component of risk is timing, with different exposures occurring at different stages of a fire.

Protective equipment is used, but it is uncomfortable to wear and might be taken off when the fire is out. However, during the clean-up stage, pockets of gas containing chemicals can be released. Some studies have shown that the worst exposures occur during this stage.

A report from the Canadian board that reviewed fire fighter health listed over 20 possible exposures. They include known carcinogens like asbestos and benzene, and some that are probable carcinogens such as acrylonitrile, which is linked to brain cancer. For other substances such as acrolein there is inadequate information on carcinogenesis. Halons, which are chemicals used in fire suppression systems, pose environmental concerns. Chloracne is a skin condition definitive for dioxin exposure, and vinyl chloride has been linked to brain cancer. Diesel exposure from the fire trucks and fumes in the station house are also a consideration.

Many studies have examined occupational hazards. Some of these were proportionate mortality studies that compared the proportion of deaths due to various causes in different populations. There are general occupational mortality data as well as studies that look specifically at fire fighters. Other information comes from cohort studies where populations of fire fighters are followed over time and absolute rates of disease are calculated. Something to remember about the earlier studies is that exposures have been changing over time with the introduction of plastics and synthetics having a large

impact. Two of the latest studies are a case control study from Atlanta, Georgia (Krstev, 1998) linking prostate cancer to fire fighters and a cross-sectional report on leukemia rates from Portland, Oregon.

There are various biomarkers that are of relevance for cancer. These can demonstrate either exposure to a known carcinogen or an actual effect. There have been reports of excess sister chromatid exchange in fire fighters as well as polycyclic aromatic hydrocarbon-DNA adducts. There were also excess serum growth factors found. Aspects that make these studies inconclusive include the small number of actual deaths examined. However, the later studies are better in that they are based on larger numbers. There is also the possibility that retired fire fighters will have a different job listed on the death certificate, obscuring the occupational exposure. In addition, some of the groups examined as cohorts, such as policemen and firemen, might not be appropriate. There is also limited information that links certain cancer sites to specific exposure indices such as years of employment, number of fires, and type of protective equipment used.

One type of cancer, which has positively linked with fire fighting, is brain cancer. There are documented exposures to known carcinogens such as vinyl chloride. Although exposure is often measured in years worked, a group in Sweden (Törnling, 1994) also assessed the number of fires attended. They found the largest excess of brain cancer in the group that had been to over 1,000 fires. These five cancer cases were also in the group that had worked the longest. These data demonstrated exposure response.

The most common death caused by cancer is due to lung cancer. This is typically associated with fire fighting due to the inhalation of many possible carcinogens. However the studies do not show an obvious pattern of excess lung cancer. A study in New Jersey (Feuer, 1986) did not find any increase, while a study from Denmark (Hansen, 1990) found a significant increase in cancer only in the oldest age category.

There are fewer studies that look at stomach cancer. In addition, they generally involve smaller numbers of individuals. In the Demers study, fire fighters had a greater risk of stomach cancer when compared to the general public, but less when compared to police.

The risk of colon cancer is often decreased in people who are physically active, such as fire fighters. However, colon cancer had many more positive studies than negative studies. Exposure measurements in these studies included number of years worked. A study by Demers (1992) showed an increase in cancer in those who had worked less than ten or more than 30 years. Another study, by Beaumont (1991) in San Francisco, was not consistent, but a study by Vena (1987) in Buffalo showed a steadily increasing risk with years of service. That study demonstrated an almost five-fold elevation in risk after more than 40 years worked.

There were also more positive than negative studies regarding fire fighting and rectal cancer, especially among the more recent, better conducted studies. Two studies

compared fire fighters to police and to the general population. In the Pacific northwest study by Demers (1992) there was a lower risk when compared to the population, but higher than the police. However, in the study by Sama (1990) in Massachusetts, the opposite results were obtained with risks higher in comparison to the population but lower when compared to police. Two studies (Tornling, 1990 and Beaumont, 1991) collected information on years of employment, number of fires, and latency. There was no increasing risk seen with these measures.

Along with lung cancer and leukemia, bladder cancer historically has often been linked to occupational and chemical exposure. Many studies have confirmed this. A study by Vena (1987) in Buffalo, New York found risks that increase with the number of years worked. Most of the studies on leukemia are also positive.

Kidney cancer is a rarer cause of death than some of the other types of cancer, and so the numbers are smaller. However there are three times as many studies that show a positive link than those which are negative. A study in Canada by Guidotti (1993), while only based on very small numbers, shows a definite increase in cancer with the number of years worked.

Prostate cancer is the most commonly diagnosed cancer, although it is not the most common death-related cancer. Here there are many more positive than negative studies. Better access to health care has been thought to be one reason that cancers such as this are more frequently diagnosed in fire fighters. However, there is an excess of prostate cancer even when compared to police, which should have equivalent health care. One case-control study (Krstev, 1998), which was based on in-person interviews and work histories, was done in Atlanta, Georgia, Detroit, Michigan and New Jersey. Although the numbers were small, there was a significant excess of prostate cancer, which seemed to increase with years worked.

Lymphatic malignancies can be difficult to precisely diagnose and so are grouped together. The incidence of non-Hodgkins lymphoma, which had been a rare cause of death, is increasing. An increased risk of this condition was reported in all but one study. Myeloma is a very rare cause of death and was not reported on in many of the studies. However, the risk for myeloma does seem to be greater for fire fighters.

Also reviewed was skin cancer. Although the reports do not distinguish between melanoma and non-melanomic skin cancer, all but two of these reports show an excess of skin cancer. This is consistently above what would be expected for this cause of death.

In summary, there was stronger evidence for an association between fire fighting and brain, leukemia, lymphoma, colon, rectal and bladder cancers. There was some evidence of an association for kidney, prostate and skin cancers with a majority of the studies being positive, but without adequate exposure analyses. There was no apparent association between fire fighting and lung cancer.

This information is changing as more studies are being reported. The 1990 review by Howe included a formal statistical analysis, but included far fewer studies than are presently available.

Currently, there is an ongoing study by Delsey Barris and Tom Garity in Philadelphia that is attempting to correlate detailed employment histories and exposure data on a large group of fire fighters. This study is looking at almost 8,000 fire fighters who were employed during the period of January 1, 1925 through December 31, 1986. Employee service record cards have provided demographic details and a variety of official records and interviews with veteran fire fighters have provided information on exposures and outcomes. There have been also inspections done at the station house to determine the equipment used and the proximity of the living quarters to the garage. Cigarette use was not determined and will need to be estimated using established data on frequency of smoking by occupation.

A standard SMR analysis was used to compare fire fighters to other groups of employed persons, as well as to the general population, and internal comparisons were also made to compare one exposure category to another. Although a lack of inclusion in the social security system made tracking fire fighters more difficult, only 7.5 percent were lost to follow up. Average age of death in this group was found to be 64; however, this should increase when those who are still living are included. Fire fighters were classified according to the level of activity during their first five years, whether it included heavy exposure. Another part of the study looked at the group that had ten years of diesel exposure. The final results of this study are not in, but preliminary information should be available for use within a few months. Effects seen in those fire fighters who were hired after 1950 will help to demonstrate the results of exposure to synthetics and plastics.

As to why lung cancer has a lower incidence than other cancers, it was stated that perhaps there was inhalation of substances that affect sites distant from the lung. For example, vinyl chloride is known to affect the liver and brain and benzene has been linked to leukemia and lymphoma. However, with the polycyclic, aromatic hydrocarbons being produced, and the amounts of smoke involved, it is surprising that there is not more lung cancer and/or chronic obstructive disease.

Regarding the protection afforded by wearing a mask, there are two potential problems. There could be penetration by chemicals that do not damage the lung. This type of breathing apparatus could be protecting from the risks most closely linked to smoke and soot, but not from various dangerous vapors. Also, the masks are cumbersome and perhaps are taken off before the danger of exposure is past. In the past, various filters were used. These did not last long and were not always effective, so the switch was made to self-contained breathing apparatuses with an air supply.

It was questioned whether fire fighters had a particular lifestyle that set them apart. The only factor noted was that fire fighters were seen as typically more aggressive and active than the general public. Most of the studies involved white men. There are not

many studies available that examine possible differences in risks for women or African-Americans. Studies do not exist that specifically examine the typical diet of fire fighters in regards to diseases such as colon and rectal cancers. A possible source of more information would be the large cancer studies that did not specifically look at fire fighters, but which included fire fighting as one occupational category.

Occasionally, there is a large fire with dangerous chemicals and many fire fighters involved. These are not specifically mentioned in the studies. Reports on one incident indicated chemicals that were eating through the boots. Some of those fire fighters later reported melanomas on their feet.

IV. PUBLIC COMMENT

Paul Hufnagel (Michigan Professional Fire Fighters) stated that there were studies available that examined the issue of protective equipment. Some studies had placed monitors inside the mask to determine the penetration of various substances. Other studies had mentioned skin exposure, or special circumstances such as cleanup or investigation after a fire

Mr. Hufnagel said that soot had been a problem in the stations where he had worked. This was particularly a problem after the switch was made in the late 1960's and early 1970's from gasoline to diesel equipment. Although the state had conducted a study that stated that the air was okay, the soot was on everything. Mr. Hufnagel stated that railroad workers had been evaluated as to a possible problem with exposure to diesel exhaust. However, fire fighters had possibly three times as high an exposure to diesel fumes as did railroad workers. He also mentioned that in Michigan most fire and police units are involved with local pension systems. There is not a general statewide pension plan. The vetoed bill was proposed to act as a backup to existing pension systems and would not have had a big economic impact in Michigan.

IV. PANEL DISCUSSION

Dr. Fischer asked whether the Panel should focus their efforts strictly on cancer, or whether the general effects of toxic substances should be addressed. Mr. Tennis (Capitol Services) clarified that the bill from which this charge originated was written to add certain forms of cancer to the existing heart and lung presumption law. These cancers were those which were felt to be most strongly associated with fire fighting. Dr. Swanson added that the charge specifically mentioned certain cancers such as respiratory tract, bladder, skin, brain, kidney, blood and lymphatic. It was agreed to focus on cancer in general, and not to include other possible effects such as heart disease.

Dr. Fischer questioned whether there were any other experts who would be available to present information on this subject. Mr. Hufnagel distributed to the Panel a report that had been prepared by Dr. Thorn for the Senate hearing. He stated that he would like to bring Dr. Thorn to speak to the Panel if scheduling that would be possible. Mr. Harrison

stated that although the Panel had been requested to provide the results of their investigation as soon as possible, there was no specific deadline.

Dr. Kummeler questioned the statistical significance of the various studies cited by Dr. Zahm. It was noted that not all of the studies that were classified as positive had the statistical power to demonstrate even a two-fold excess risk. Dr. Fischer added that some epidemiologists feel that a positive study should be given more weight than a negative one. Dr. Swanson countered that it would depend on how the calculations were made, and that there was perhaps too much attention paid to positive studies and not enough attention given to studies that were negative.

V. PANEL ASSIGNMENTS

It was questioned whether a meta-analysis of all the studies would be feasible and beneficial. Dr. Swanson offered to look at the material available to see if there was enough to combine. She said that she would do a summary of the strengths and weaknesses of each study. A systematic approach looking for certain criteria such as exposure and outcome issues could result in a table that summarized the literature. Dr. Swanson stated that she would also investigate the database available to her regarding cancer in metropolitan Detroit. This study looked at the differences in occupational exposure using a case-control approach. In addition, Dr. Swanson said that she would check with her contacts at the National Institute for Occupational Safety and Health to see if they had any current studies or other information.

Dr. Demers said that he would contact Peter Oris to determine the status of the study that he had been conducting. Dr. Demers stated that it would be helpful to have a copy of the new state law as it had been proposed in Michigan. It would also be useful to compare this legislation to that which had been in about 18 other states. This could provide insight into the scientific rationale for the laws. It was decided that Dr. Swanson would focus on the studies and that Dr. Demers would look at occupational medicine and presumption issues as well as the state laws.

Dr. Demers inquired whether the Panel should wait to make their report until they received the information from the study which Dr. Zahm was working on in Philadelphia. It was noted that the study was scheduled to be presented to the city and the local fire fighter's union in two months, although delays are possible. It was decided that data from this study would be useful to include if it was available within the time needed by the Panel to produce its report.

Dr. Fischer mentioned a toxicologist in Pittsburgh, Yves Alarie, who had done animal and human studies on fires and smoke inhalation. This is a possible source for more information.

Dr. Kummeler agreed to investigate the available information on exposures. He stated that information on smoking history (and other possible confounders) would help to put the risks for fire fighters in perspective.

Mr. Harrison said that he would send the Panel members a copy of the letter regarding the legislation that was vetoed. He also requested that anyone who had additional information send it to him so that he could copy and distribute it.

VI. NEXT MEETING DATE

The next meeting would be scheduled for sometime in January.

VII. ADJOURNMENT

The meeting was adjourned at 11:42 AM.

Respectfully submitted,
Keith G. Harrison, M.A., R.S., Cert. Ecol.
Executive Director
Michigan Environmental Science Board